REMARKS

The final Office Action of January 12, 2006 has been received and its contents carefully considered.

In this Amendment, the original claims have been substantially amended to better define the claimed invention and more clearly distinguish over the applied prior art. Specifically, claims 2-3, 9-10, 15-28 and 32-51 are canceled (without waiver of or prejudice to the subject matter thereof), claims 1, 4-8, 11-14 and 29-31 are revised, and new claims 52-71 are added. As amended, the total number of claims in the application is 33, and the number of independent claims is 6, which is the same as the original number of independent claims.

In addition, the title of the invention is amended herein to add the words "AT INFRARED WAVELENGTHS." The applicant believes that the amended title is more clearly indicative of the invention to which the claims are directed. The Examiner is respectfully requested to approve and enter the new title.

In this Amendment, the subject matter of claims 9-14 has been consolidated into claims 1-7 so as to eliminate the distinction in original claim 2 and 9 between "transmitting said infrared signal" and "receiving said infrared signal." Further, the limitations of cancelled claims 2 and 3 have been incorporated into claim 1. Original claims 15-28, which were directed to "a terrestrial base station communications system," have been canceled entirely.

In the Action, independent claims 1 and 15 are rejected under 35 U.S.C. 102(e) as being anticipated by Mendenhall et al. (U.S. Patent No. 6,535,314). Further, claims 2-3, 7, 9-10, 14, 16-17, 23-24, 28-29, 36-39 and 46-51 are rejected under 35 U.S.C. 103(a) as being obvious over Mendenhall in view of Badesha et al. (U.S. Pat. Appl. Publ. No. 2002/0167702). It is respectfully submitted that these rejections are overcome by the claim amendments set forth herein.

With regard to original claim 1, the Examiner points to Mendenhall as teaching a satellite communications system comprising: a terrestrial base station (Fig. 1B, 26); and a first satellite (Fig. 1B, 10) communicating with said terrestrial base station using an infrared signal (optical beam, column 6, lines 63-64).

The Mendenhall reference is directed to an apparatus and method that can be used in a satellite system for acquisition and tracking of an optical communications beam (see Abstract).

Mendenhall does not address the viability of a satellite communications system with the necessary considerations of geographic location, atmospheric attenuation, satellite orbits and frequency selection. With regard to the issue of frequency selection, Mendenhall refers to the "sending and receiving of beams 16 and 17," (column 6, lines 63-64), stating that" for example, beam 16 is transmitted at 1.554 microns and that beam 17 is transmitted at 1.546 microns" (column 7, lines 4-5), which are close to the visible spectrum. Mendenhall fails entirely to teach the advantageous use of longer wavelength signals in the infrared spectrum, as required by all of the independent claims, including claim 1, to significantly reduce path attenuation. New claims 54, 57-58, 62, 67 and 70 add the further limitation that the wavelength of the infrared signal is "about 10 microns."

With respect to the limitations recited in original claims 2 and 3, the Examiner acknowledges that Mendenhall fails to teach that the optimal location for transmitting the infrared signal is determined based on a frequency of the infrared signal and the attenuation of the infrared signal at the frequency. However, the Examiner asserts Badesha discloses that clouds, rain and fog can scatter optical beam energy and disrupt communications (page 1, paragraph 0005, lines 8-10). The Examiner further asserts Badesha teaches that one approach to mitigate the problem is to have several ground stations at different locations so that a transmission can be sent from the ground station that is least obstructed (optimal location) by clouds (page 1, paragraph 0006). The Examiner agues that it would have been obvious for one of ordinary skill in the art at the time the invention was made to determine an optimal location for transmitting and receiving the infrared signal based on a frequency of the infrared frequency and the attenuation of the infrared signal at the frequency to provide a reliable communication capability.

The applicant respectfully disagrees. The Badesha reference is directed to an optical communication system using a high altitude tethered balloon that operates above most clouds and atmospheric turbulence. A balloon-based optical transceiver maintains line of sight optical communication with a satellite. Data is transmitted to a ground station from the balloon through a fiber optic channel attached to the tether (see Abstract). Thus, Badesha is not directly relevant to the current application because the balloon with its closed fiber optic connection to the ground station largely avoids the atmospheric attenuation problems to which the present invention is addressed.

The text in Badesha relied upon by the Examiner (paragraph 0006) describes a prior art systems that mitigates some of the short term variations in the attenuation of optical signals, caused by cloud cover, by using a plurality of earth stations in the same region that are spaced a minimum distance apart (e.g., 200 km). In such a "diversity" system, the communication path used at any particular time is the one that yields the best communications performance. As Badesha points out, the cost of the multiple earth stations and inter-facility links required by such a diversity system can be prohibitive.

By contrast, claim 1 of the present invention requires the optimal location of a terrestrial base station to be determined based on the attenuation of the infrared signal, the attenuation being "determined based on a cloud water content for communication at zenith, persisting in a region in which said terrestrial base station is located." Thus, in the present invention, the selection of an optimum location is based on the cloud water content "persisting" (i.e., considered on a long term basis) in a "region" in which the terrestrial station is located (i.e., not at different locations within the same region). Moreover, Badesha makes no specific reference to cloud water content, per se, as an operative parameter in determining path attenuation.

Amended claim 1 also includes the limitation "wherein said first satellite is configured in an inclined elliptical orbit having an apogee at or near zenith for said terrestrial base station." New independent claims 59 and 64 contain similar language. This requirement emphasizes the importance of utilizing near-zenith communication paths to achieve the lowest possible atmospheric attenuation (see, for example, application page 19). It is respectfully submitted that neither Mendenhall nor Badesha teaches or suggests this limitation.

For the foregoing reasons, it is respectfully submitted that amended claim 1, as well as dependent claims 4-7 and 52-54, patentably distinguish over the Mendenhall and Badesha references, whether considered individually or in combination.

It should be clear from the forgoing arguments that amended claims 29-31 and new claim 58, which are directed to a method for determining an optimal location for a terrestrial base station communicating with a satellite using an infrared signal, also patentably distinguish over the applied references. Further, amended claim 29 includes the limitation "determining an attenuation of said infrared signal at each of said plurality of locations based on said cloud water content and on a probability density function of an elevation angle to said satellite from

said locations" (emphasis added), the latter requirement being incorporated from canceled claims 36-38. In the Office Action, the Examiner argues that it would have been obvious, based on paragraph 0005, lines 6-8, of Badesha, to determine an optimal location based on the probability function of an elevation angle to reduce the distance for an optical signal to travel in the atmosphere. It is respectively submitted that the Examiner's argument constitutes a hindsight reconstruction of the invention, one that is not supported by any relevant teaching or suggestion in the references. The text relied upon by the Examiner in Badesha refers only generally to the "problems associated with the operation of optical communications systems in the atmosphere." However, because the system in Badesha operates substantially above the atmosphere, Badesha does not concern itself with, and therefore fails entirely to address, satellite orbits or selecting an optimal location for an earth station based on an elevation angle to a satellite.

Claim 8 is amended herein to put it in independent form, incorporating the limitations of original claims 1-3. Regarding claim 8, the Examiner acknowledges in the Office Action that Mendenhall does not teach including a second satellite, a third satellite, a forth satellite and a fifth satellite, the first satellite, the second satellite and the third satellite each being in a phased Molniya orbit, and the fourth satellite and the fifth satellite each being in a geosynchronous orbit. However, the Examiner points to the Ross reference (U.S. Patent No. 5,218,467) as teaching a satellite communications system having a synchronous satellite (Fig. 1, 1) communicating with six Molniya orbit satellites. Therefore, argues the Examiner, it would have been obvious for one of ordinary skill in the art at the time the invention was made to include more than one geosynchronous satellite and a plurality of Molniya orbit satellites in the satellite communications system taught by taught by Mendenhall to increase the area that the satellite communication system covers.

The applicant respectfully disagrees with Examiner's argument. Ross is directed to a satellite system for optical communications in which up to six low earth orbiting satellites send satellite data, which is relayed to a ground station on the earth's surface (see Abstract). However, the system disclosed in Ross differs from the claimed invention in at least two important respects. First, the constellation of data collection satellites in Ross are disclosed as being in low earth orbits, not the Molniya orbits specified in amended claim 8. A Molniya orbit is a 12-hour elliptical orbit, in which the satellite, while at or near apogee, occupies a location

far above the Northern hemisphere for up to eight hours (see, for example, application Figure 17).

Second, amended claim 8 recites "a constellation of satellites each communicating directly with said terrestrial base station using an infrared signal" (emphasis added). In Ross, by contrast, the terrestrial base station 3 (Fig. 1) communicates only with the geostationary satellite 1, which acts as a relay point for data from the low earth satellites 2 (column 2, lines 32-51). The system in Ross does not provide for communication by the terrestrial base station directly with each of the low earth orbit satellites, as claim 8 requires. Moreover, each of the low earth orbit satellites in Ross communicates over an optical link with the geosynchronous satellite, but the communication link between the geosynchronous satellite and the terrestrial base station is RF. Thus Ross fails to disclose communication directly with the terrestrial base station using an infrared signal, as claim 8 requires.

For at least the forgoing reasons, it is respectfully submitted that amended claim 8, as well as amended claims 11-14 and new claims 55-57, patentably distinguish over the applied references, whether considered individually or in combination.

New claims 59-63 are directed to an embodiment of the present invention employing space diversity to further improve performance, which is disclosed in Figure 23 and discussed on pages 21 and 22 of the present application. New claims 64-68 are directed to another embodiment of the present invention employing angle, which is disclosed in Figure 23 and discussed on page 22 of the application. Finally, new claims 69-71 are directed to a further embodiment in which the satellites are replaced by a high altitude orbit aircraft, as disclosed on pages 22 and 23 of the application. The applicant believes that for the reasons previously discusses, claims 59-71 are also allowable.

It is respectfully requested that this Amendment be entered and examination continued pursuant to 37 CFR §1.114. It is submitted that the application, as amended, is in condition for allowance. Notice of such allowance and the passage of this application to issuance are respectfully solicited.

[Continued on next page]

Should the Examiner feel that a conference would help to expedite the prosecution of this application, the Examiner is hereby invited to contact the undersigned counsel to arrange such an interview.

Respectfully submitted,

May 12, 2006
Date

Phillip G. Avruch - Reg. No. 46,076
RABIN & BERDO, P.C.
Telephone: 202-371-8976
Telefax: 202-408-0924
CUSTOMER NO. 23995

PGA/